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NOTICES OF The Aëronautical Society of Great Britain.

At a meeting of the Council of the Aëronautical Society of Great Britain, held at 53, Victoria Street, Westminster, on Monday, March 19th, 1906, the following gentlemen were elected members of the Society:—

Mr. CHARLES J. P. CAVE, F.R.Met.Soc.
Mr. FREDERICK S. DRAPER.
Mr. EDWARD CHANING WILLS, M.A., F.C.S.

THE LIBRARY.

The following publications have been presented to the Library:—

By Major B. Baden-Powell: Various publications of the Smithsonian Institution.

By Editor of *Knowledge and Scientific News*: "Knowledge and Scientific News," (January, February, and March, 1906).

By A. Lawrence Rotch: "The First Observations with Registration Balloons in America" (Proceedings of the American Academy of Arts and Sciences), and "Sur les preuves directes de l'existence du contre-alizé," L. ROTCH and L. TEISSERENC DE BORT.

By D. Pedro Vives V. Vich: "Algunas Observaciones Acerca del Tiro contra Globos."

Prospective Arrangements.

GENERAL MEETING.

The second meeting of the forty-first session of the Aëronautical Society of Great Britain will be held at the Society of Arts, on Friday, April 27th, at 8 p.m. The President, Major B. Baden-Powell, will take the chair.

On this occasion, Captain Robert Falcon Scott, R.N., M. Aër. Soc., Commander of the recent British Antarctic Expedition, will address the Society, on "The use of the Balloon in the Antarctic Expedition" (with lantern illustrations.)

The following papers will also be read:—

"The experiments of the Brothers Wright," by Sir Hiram S. Maxim.

"The Carrying Power of Aëroplanes," by M. José Weiss. (With practical demonstrations.)

Flying Model Competition.

The Flying Model Competition for the prize of ten pounds, offered by Major B. Baden-Powell, will be held at the summer meeting of the Aëronautical Society of Great Britain, at Sunningdale, Ascot, in

July next. Entries must be made by the end of May. The following are the rules drawn up by the Council of the Aëronautical Society of Great Britain:—

1.—The apparatus may be of any form, but shall not weigh all complete more than one pound.

2.—No gas or hot air for bouyancy shall be used.

3.—Any propelling force, such as compressed air, petrol, spirits, etc., may be employed (although it is probable that india-rubber springs will alone be found practicable in so small a machine), but no springs, explosives, or other agencies apart from those carried by the machine, and included in its weight, shall be used to give an initial impulse.

4.—The apparatus shall be started from the ground, or from a table or releasing gear, not more than 6 feet above the ground.

5.—The apparatus shall fly through the air for a distance of at least one hundred feet, so that the distance from the ground, from the place of starting to place of falling shall be, when measured in a straight line, not less than one hundred feet. It must accomplish this distance twice over (with a short interval between), in opposite directions.

6.—The prize will be given to the competitor whose machine covers the greatest distance.

7.—The prize will not be awarded unless there are three or more genuine competitors.

8.—Each competitor shall be held responsible for any damage or accident that may occur to or by means of his apparatus.

9.—The competition shall be open to all, of any nationality, who shall be approved by the Council of the Aëronautical Society of Great Britain.

10.—Members of the Aëronautical Society of Great Britain shall have to pay no entrance fee, but to non-members there shall be an entrance fee of half-a-guinea.

11.—The award of the prize shall be decided by a jury of at least three members, to be appointed by the Council of the Aëronautical Society of Great Britain, who shall decide all points of doubt and use their discretion as to the disqualification of any apparatus which they may consider not to comply with the original purpose of the competition, or one which they consider in any way dangerous.

12.—The decisions of the jury shall be accepted as final.

In issuing these general rules, the Council reserve to themselves the right of making any modification or additional regulations which may tend to facilitate the carrying out of the competition.

The following have already kindly consented to act on the jury:—

Major B. Baden-Powell (President Aëronautical Society of Great Britain), Mr. William Henry Dines, F.R.S. (late President Royal Meteorological Society), Mr. E. P. Frost, J.P., D.L., Lt.-Colonel J. D. Fullerton, R E., Sir Hiram S Maxim, Dr. Hugh Robert Mill, D.Sc., L.L.D. (Secretary, Royal Meteorological Society), Dr. William Napier Shaw, Sc.D., F.R.S. (Director of the Meteorological Office), and Mr. Eric Stuart Bruce, M.A., Oxon. (Hon. Secretary, Aëronautical Society of Great Britain). All communications respecting this competition, should be addressed to the Honorary Secretary, Aëronautical Society of Great Britain, 53, Victoria Street, Westminster, London, S.W.

Kite Display.

It has been arranged to hold a Kite Display at a convenient distance from the Metropolis, at the summer meeting of the Aëronautical Society of Great Britain, in 1907. Full particulars will be announced later.

ANNUAL SUBSCRIPTIONS.

The annual subscriptions to the Aëronautical Society of Great Britain became due on January 1st. Those members who have not yet paid their annual subscriptions are requested to forward them to the Honorary Secretary, 53, Victoria Street, Westminster, London, S.W. The attention of those members is called to Rule IVa., which states that the privileges of members extend only to those who have paid their subscriptions for the current year.

ERIC STUART BRUCE,
Honorary Secretary.

The Loan Exhibit of the Aëronautical Society of Great Britain at the Milan Exhibition.

By arrangement with the British Commission of the Milan Exhibition, the Aëronautical Society of Great Britain has sent a loan collection of photographs, prints, diagrams, and other objects of Aëronautical interest, for exhibition in the Aëronautical Section of the Milan Exhibition.

The exhibit is largely representative of the recent work of members of the Aëronautical Society of Great Britain, and is illustrative of modern progress in the two departments of aëronautics which deal respectively with attempts to navigate the air by the body lighter than air—the balloon, and the body heavier than air—the aëroplane

The following are amongst the exhibits:

1.—Portraits. Major B. Baden-Powell (President, Aëronautical Society of Great Britain); Sir William Crookes, F.R.S.; James Glaisher; Henry Coxwell; Percy S. Pilcher, a British Martyr of the Air; some celebrities of the Paris International Congress, 1900, including Colonel F. C. Trollope, M. Jansson, M. Wilfred de Fonveille, M. Louis Triboulet, Mr. A. Lawrence Rotch (Director of the Blue Hill Observatory); Mr. Eric Stuart Bruce, M.A., Oxon. (Honorary Secretary, Aëronautical Society of Great Britain).

2.—Selected illustrations from the quarterly "Aëronautical Journal," published by the Council of the Aëronautical Society of Great Britain.

3.—Various prints from photographs of Major Baden-Powell's aëroplane experiments in 1904.

4.—Complete set of prints from photographs of the kites taking part in the International Kite Competition, organized by the Aëronautical Society of Great Britain, on the Sussex Downs in June, 1903.

5.—Prints from photographs of the paths of aërial gliders, illustrative of researches by Professor G. H. Bryan, F.R.S., and diagrams of the longitudinal stability of aëroplanes.

6.—Stereoscopic view of the British war balloon, ready to ascend during Lord Roberts' advance to Pretoria, in the South African war, mounted in stereoscope.

7.—Photograph of an aluminium airship.

8.—Photographs and diagram of Mr. Hitchcock's toboggan gliders at Montreal.

10.—Photographs of the de Bradsky airship.

11.—Photographs of Dr. Hutchinson's bird-like flying machine.

12.—Photographs of Mr. Alexander Burgoyne's aluminium kite.

13.—Photograph of Mr. Wilson Fox's kite.

14.—Photograph of Mr. W. H. Salmon's rhomboidal kite.

15.—Photographs of box kite and winding gear used in Mr. Bruce's Scottish Antarctic Expedition, 1902.

16.—Photographs of Mr. Zimmerman's cycala flying machine.

17.—Prints of airships at the St. Louis Exhibition, 1904.

18.—Charts, showing wind forces as taken on the Eiffel Tower, on the days of M. Santos Dumont's navigable balloon experiments in 1901.

19.—Prints of experiments with Major Baden-Powell's man-lifting kite.

20.—Prints from photographs of the Bacon and Maskelyne hot-air balloon.

21.—The altimeter (actual instrument), for taking observation of the highest altitude reached by kites and balloons invented by Messrs. Newton and Co.

The Late Professor S. P. Langley.

(By the Editor.)

By the death of Professor S. P. Langley aëronautics has not only lost one of its most steadfast workers, but one who, by his elucidation of some of its most difficult problems, did more than any other man has done to show that human flight was no chimera, but a scientific possibility. It might well be asked whether if Langley had not lived there might not still exist much of the old prejudice against the student of aëronautics, a prejudice, which called him a dreamer, and dulled even the eyes of men of light and learning.

Samuel Pierpoint Langley was born at Roxburg, Massachusetts, August 22nd, 1834. After graduating from the Boston Latin School, he devoted himself at first to civil engineering, and then to architecture. He soon, however, abandoned these professions to devote himself to astronomy. It was, indeed, as an astronomer that Professor Langley was generally known, though in the mind of the aëronautical student his achievements with the aëroplane is his most prominent work.

In 1863 he went to Europe, and there visited foreign observatories and scientific institutions, and on his return to America in 1865, became an assistant in the Harvard Observatory, where he only remained a few months, being appointed Professor of mathematics in the United States Naval Academy of Annapolis, in 1866. In the same year he was appointed Professor of Astronomy in the Western University of Pennsylvania, at Pittsburg, where he remained until 1887. In that year he was appointed assistant secretary of the Smithsonian Institution at Washington. Before the close of the same year he had succeeded to the full secretaryship of that important institution, a post which he retained until the day of his death. It was in connection with that institution that he displayed his remarkable powers of organisation and administration. In an excellent notice of his scientific work, which appeared in the pages of *Nature*, on March 8th last, will be found a *resume* of the principal features of his connections with the Smithsonian Institution. How he founded the children's room in its museum; how the long-established Bureau of American Ethnology flourished vigorously under his care, until it assumed "magnificent proportions"; how he established a Zoological Park containing the wild animals of his native land.

Professor Langley accompanied many of the parties sent out by the United States Government to observe eclipses in various parts of the world. In connection with his astronomical work must be mentioned his faithful drawings of the solar surface, his writings on the physical constitution of the sun, his spectroscopic studies, and his invention of the bolometer, a sensitive instrument for measuring minute changes in heat, an instrument which has been of the greatest value in increasing our knowledge of the infra red of the spectrum.

But it is the aëronautical work of the lamented physicist that claims the chief attention of these pages.

From boyhood, Langley had been interested in aërial flight, but took up the subject seriously in 1889. In 1891, Langley published his "Experiments in Aërodynamics," a work which proved a corner-stone in aëronautical progress. In this work it is conclusively shown that with means actually possessed we have the power to sustain and propel in air bodies which are heavier than air. Further than this, that if in such aërial motions there is given a plane of fixed size and weight, inclined at such an angle, and moved forward at such a speed that it shall be sustained in horizontal flight, then the more rapid the motion is, the less will be the power required to support and advance it.

The experiment by which Langley arrived at this conclusion may be described as a classical one. It was undertaken at Pittsburg, when he was Professor of the Astronomical Observatory there. In his laboratory, built for aërial investigations, he had provided a whirling table—an arm, 30 feet long, which swung about on a central pivot, 10 feet above the ground. It was rotated by a 10-horse power steam engine, and it went round at all speeds up to seventy miles an hour. On the end of the arm were instruments that measured the lifting power of the wind upon any inclined surface hung on them. When a spring scale, to which brass plates were attached, hung there it was found that the faster the arm rotated, the less weight the plates registered on the scales until at great speeds they almost floated in the air. The higher the speed, the less was the force required to keep the plates from falling.

After carrying out the experiments described in the above-mentioned work, the Professor says he was convinced that the obstacles in the way of attaining aërial navigation were not so great as have been thought, and that they lie more in such apparently secondary difficulties as the power of guiding the body so that it may move in the direction desired, and ascend or descend with safety, than in what may appear to be the primary difficulties due to the nature of the air itself.

In 1893, Langley produced his celebrated paper on "The Internal Work of the Wind." This was written to show the reason why certain species of birds maintain themselves indefinitely in the air by soaring without

any flapping of the wing, or any motion other than a slight working of the body.

No satisfactory mechanical explanation of this anomaly had been given before this work was published.

That the ability to soar was in some way connected with the presence of the wind was, to the writer, as certain as any fact of observation could be, though at first, the difficulty of reconciling such facts with accepted laws of motion seemed quite insuperable.

We are told that light came to him through one of those so-called accidents which are commonly found to occur when the mind is intent on a particular subject, and looking everywhere for a clue to its solution. In 1887, while engaged with the whirling table in the open air, at the Allegheny Observatory, he had chosen a quiet afternoon for certain experiments, but in the absence of the entire calm which is almost never realized, had placed one of the very small and light anemometers, made for hospital use, in the open air, with the object of determining and allowing for the velocity of what feeble breeze existed. His attention was called to the extreme irregularity of this register, and he assumed at first that the day was more unfavourable than he had supposed. Subsequent observations, however, showed that when the anemometer was sufficiently light and devoid of inertia, the register always showed great irregularity, especially when its movements were noted, not from minute to minute, but from second to second.

When Langley's attention was once aroused to these anomalies, he was led to reflect upon their extraordinary importance in a possible mechanical application. He designed certain special apparatus, with which he made observations which showed that the wind in general was not what it was commonly asserted to be, that is, air put into motion with an approximately uniform velocity, in the same strata; but that, considered in the narrowest practical section, wind is always not only approximately uniform, but variable, and irregular in its movement beyond anything which had been anticipated, so that it seemed probable that the smallest part observable could not be treated as approximately homogeneous, but that even here there was an internal motion to be considered distinct from that of the whole body, and from its immediate surroundings. It seemed to follow as a necessary consequence that there might be a potentiality of what might be called internal work in the wind. On further study it seemed to him that this internal work might conceivably be so utilized as to furnish a power which should not only keep an inert body from falling, but cause it to rise, and while this power was the probable cause of the action of the soaring bird, it might be possible through its means to cause any suitably disposed body, animate or inanimate, wholly immersed, and wholly free to move, to advance against the direction of the wind itself.

But Langley was much more than a theorist. In 1896, he constructed his steam-driven flying models, called aërodromes, and made almost entirely of steel. One of these accomplished the longest flight then known for a flying machine, more than three-quarters of a mile, over the Potomac River. The apparatus consisted of two pairs of wings and a tail, with two screw propellers driven by a high pressure engine of 1-horse power, and weighing 7 lbs. The apparatus alighted safely after each of the three flights made. The lift per horse-power was not high, for a variety of reasons, but the stability was very good. In fact, on the occasion of the most successful flight, the machine is described as darting forth from its launching stage and travelling in an almost straight line through the air for over three-quarters of a mile. Langley called his models aërodromes instead of aëroplanes, as such a name was more applicable to arched surfaces, which are more efficient than plane surfaces.

Thus does Langley describe the first flight of the aërodrome, after the first desultory experiments: "On the 6th of May of last year, I had journeyed, perhaps for the twentieth time, to the distant river station, and recommenced the weary routine of another launch, with very moderate expectations, indeed; and when on that, to me, memorable afternoon the signal was given and the aërodrome sprang into the air, I watched it from the shore with hardly a hope that the long series of accidents had come to a close; and yet it had, and for the first time the aërodrome swept continuously through the air like a living thing, and as second after second passed on the face of the stop watch, until a minute had gone by, and it still flew on; and as I heard the cheering of the few spectators, I felt that something had been accomplished at last, for never in any part of the world or in any period had any machine of man's construc-

tion sustained itself in the air before for even half of this brief time. Still, the aërodrome went on in a rising course, until at the end of a minute and a half, for which time only it was provided with fuel and water, it had accomplished a little over half a mile, and now it settled, rather than fell, into the river with a gentle descent."

For a still fuller description of the flight of Langley's aërodrome, the reader is referred to the January number of this Journal, 1897.

It will suffice here to quote the following technical details of the 1896 machine:

Length from tip to tip .	12 feet.
Surface . . .	70.0 sq. ft.
Weight . . .	72.00 lb.
Pounds per S. F. . .	0.43
Speed per hour . .	24 miles
Maximum Flight . .	4,000 feet
Horse Power . .	1.00
Pounds sustained per H.P.	30
Motive Power . .	Steam

Langley had become too much inspired with confidence in the ultimate triumph of the heavier than air principle to be content with working models, and his later efforts were vigorously directed to the production of a motor-driven aëroplane that would carry a human being. It is well known that these more ambitious projects were not crowned with the success he had hoped to secure, but, as he has pointed out, they could not be described as failures, for the very reason that it was the launching apparatus which failed, the aëroplane never having been in the air at all. So whether or no Langley was on the border of success, or further from it than he reckoned, cannot be said, anyhow, those who have read his pamphlet, lately published, and entitled "Experiments with the Langley Aërodrome (Smithsonian Report for 1904"), must feel convinced that had the great investigator been able to continue the experiment, which was stopped for want of funds, the launching difficulties would, at any rate, have been overcome, and a just estimate have been formed of the capabilities of the machine.

The following particulars concerning his recent experiments may be of interest.

In the above-mentioned work, Professor Langley thus described how his work with models developed into the experiments with the large-sized man-carrying machine: "In the early part of 1868, a board composed of officers of the army and navy was appointed to investigate these past experiments, with a view of determining just what had been accomplished, and what the possibilities were of developing a large-sized man-carrying machine for war purposes. The report of this board being favourable, the Board of Ordnance and Fortification of the War Department decided to take up the matter, and I, having agreed to give, without compensation, what time I could spare from official duties, the Board allotted 50,000 dollars for the development, construction, and test of a large aërodrome, half of which sum was to be available immediately, and the remainder when required. The whole matter had previously been laid before the Board of Regents of the Smithsonian Institution, who had authorised me to take up the work, and to use in connection with it such facilities of the Institution as were available."

One of the greatest difficulties encountered in the construction of the large machine was the engine. Langley searched all over America for an adequate one. Disappointed in his search there, he went to Europe to personally visit large builders of engines for automobiles, and to try and persuade some maker to undertake the construction of such an engine as was required. "This search was, however, fruitless, as all of the foreign builders, as well as those of this country, believed it impossible to construct an engine of the necessary power, and so light as I required (less than 10 pounds to the horse-power, without fuel or water). I was, therefore, forced to return to this country and to consent most reluctantly, even at this late date, to have the work of constructing suitable engines undertaken in the shops of the Smithsonian Institution."

The following is Langley's own description of the essential features of the man-carrying machine:

"The flying weight of the machine complete, with that of the aëronaut, was 830 pounds, its sustaining surface 1,040 square feet. It therefore was provided with slightly greater sustaining surface, and materially greater relative horse-power than the model subsequently described, which flew successfully. The whole horse-power of the engine was 52; the engine itself, without cooling water or fuel, weighed approximately 1 kilogram to the horse-power. The entire power plant, including cooling water, carburettor, battery, etc., weighed materially less than 5 lbs. to the horse-power. Engines

for both the large machine and the quarter size model were completed before the close of 1901, and they were immediately put in their respective frames, and tests of them and their power-transmission appliances were begun. It is well here to call attention to the fact that although an engine may develop sufficient power for the allotted weight, yet it is not at all certain that it will be suitable for use on a machine which is necessarily so light as one for traversing the air, for it would be impossible to use, for instance, a single cylinder gasoline engine in a flying machine, unless it had connected to it prohibitively heavy fly-wheels. These facts being recognised, the engines built in the Smithsonian shops were provided with five cylinders, and it was found upon test that the turning effect received from them was most uniform, and that by suitable balancing of rotating and reciprocating parts they could be made to work so that there was practically no vibration even when used in the very light frames of the aërodromes.

"The engine is not all the apparatus connected with the development and delivery of power, for obviously there must be shafts, bearings, and in the present case there were also gears; and all of these parts must necessarily be phenomenally light, while all of the materials must be capable of withstanding repeated and constant strains far beyond their elastic limit. It is also evident to anyone having familiarity with such constructions, that it is most difficult to keep the various bearings, shafts, gears, etc., in proper alignment without adding excessive weight, and also that when these various parts once get out of alignment when subject to strain, the disasters which are caused render them unfit for further use.

"The engines themselves were successfully completed before the close of 1901, and were of much more power than those originally designed, but nearly a year and a half had been spent not only in their completion, but in properly co-ordinating the various parts of the frame carrying them, repairing the various breakages, assembling, dismounting, and reassembling the various parts of the appliances, and in general rebuilding the frame and appurtenances to correspond in strength to the new engines.

"There are innumerable other details, for the whole question is one of details. I may, however, particularly mention the carburettors, which form an essential part of every gas engine, and such giving fair satisfaction for use in automobiles were on the market at the time, yet all of these failed to properly generate gas when used in the tests of the engine working in the aërodrome frame, chiefly because of the fact that the movement of the engine on this light frame must be constant and regular or the transmission appliances are certain of distortion. It was, therefore, necessary to devise carburettors for the aërodrome engines which would meet the required conditions, and more than half a dozen were constructed, which were in advance of anything then on the market, and yet were not good enough to use in the aërodrome before a satisfactory one was made. These experiments were made in the shop, but with an imitation of all the disturbing influences which would be met with in the actual use of the machine in the air, so as to make certain, as far as possible, that the first test of the machine in free flight would not be marred by mishaps or unseen contingencies in connection with the generation and use of power."

In giving these details, Langley well pointed out that only those who are initiated in such experiments can appreciate the delays which must be experienced in carrying out such experiments. But in conducting such experiments delay is prudence. How many are the experimenters in aëronautics who have pushed on their experiments in over eagerness to put their inventions to the test, without waiting for the missing link, in the absence of which the truly scientific mind refuses to proceed? How many, in consequence of undue haste have met with disaster and death? Langley states that it was only in the spring of 1903, after two years of assiduous labour, that the engines and their appurtenances, weighing altogether less than 5 pounds to the horse-power, and far lighter than any known to be then existing, were so co-ordinated and adjusted, that successive shop tests could be made without causing injury to the frame, and its bearings, shafts, or propellers.

As at the time mentioned above, all appeared to be ready for immediate experiment, the large aërodrome and quarter size counterpoint for preliminary experiments, were placed on board a large houseboat, and the whole was towed to a point in the Potomac River, 3 miles wide, directly opposite Wide Water, Virginia, and about 40 miles below Washington, and midway between the Maryland and Virginia shores,

where the boat was made fast to moorings which had previously been placed in readiness for it.

"Before the test was made, many delays were encountered owing to storms and other circumstances, but on the 7th October, 1903, the long-awaited experiment was made. In this, the first test, the engineer took his seat, the engine started with ease and was working without vibration, at its full power of over 50-horse, and the word being given to launch the machine, the car was released and the aërodrome sped along the track. Just as the machine left the track, those who were watching it, among whom were two representatives of the Board of Ordnance, noticed that the machine was jerked violently down at the front (being caught, as it subsequently appeared, by the falling ways), and under the full power of its engine was pulled into the water, carrying with it its engineer. When the aërodrome rose to the surface, it was found that while the front sustaining surfaces had been broken by their impact with the water, yet the rear ones were comparatively uninjured. As soon as a full examination of the launching mechanism had been made, it was found that the front portion of the machine had caught on the launching car, and that the guy post, to which were fastened the guy wires, which are the main strength of the front surfaces, had been bent to a fatal extent. The machine then had never been free in the air, but had been pulled down."

The second and last attempt was made on December 8th, 1903. "The engine being started, and working more satisfactorily, the order was given by the engineer to release the machine, but just as it was leaving the track, another disaster, again due to the launching ways, occurred. This time, the rear of the machine in some way still unexplained, was caught by a portion of the launching car, which caused the rear sustaining surface to break, leaving the rear entirely without support, and it came down almost vertically into the water. Darkness had come before the engineer, who had been in extreme danger, could aid in the recovery of the aërodrome. The boat and machine had drifted apart, and one of the tugs, in its zeal to render assistance, had fastened a rope to the frame of the machine in the reverse position from what it should have been attached, and had broken the frame entirely in two."

The damage done to the machine by this accident was by no means irreparable, in fact, it is stated that while in the shop many test accidents had occurred of far more serious nature, causing greater damage, and requiring more time for repairs, but what was more serious for the immediate progress of aërial navigation, was the collapse of the funds specially provided for test experiments, and the impossibility of securing others for continuing the work. Thus did Langley sum up the situation:

"There have, then, been no failures as far as the actual test of the flying capacity of the machine is concerned, for it has never been free in the air at all. The failure of the financial means for continuing these expensive experiments has left the question of their result where it stood before they were undertaken, except that it has been demonstrated that engines can be built, as they have been, of little over one half the weight that was assigned as the possible minimum by the best builders of France and Germany; that the frame can be made strong enough to carry these engines, and that, so far as any possible prevision can extend, another flight would be successful if the launching were successful, for in this, and in this alone, as far as is known, all the trouble has come."

To Langley, it has not been granted to see the completion of his work, and it is for others to follow in his footsteps. There may be those who, on his work, may find cause to vary and modify details of his construction; but they may well follow the general principles which guided his method of researches —to submit all the workings of the mind to the rigid test of experiment, and not to neglect the preliminary laboratory investigations, where are laid sure foundations, on which to build up larger projects.

For the following details concerning Professor Langley's writings, and the honours at home and abroad which he received, the writer is indebted to the courtesy of the present acting secretary of the Smithsonian Institution.

Langley's published writings include over one hundred titles. He was Foreign Member of the Royal Society of London, a correspondent of the Institute of France, Fellow of the Royal Astronomical Society of London, Member of the Royal Institution of London, Member of the Academia dei Lincei of Rome, of the National Academy of Sciences, and of many other Institutions.

He received the degree of D.C.L., from Oxford, D.Sc., Cambridge, and among numerous others, the degrees of LL.D. from

the Universities of Harvard, Princeton, Michigan, and Wisconsin. He was awarded the Henry Draper Medal by the National Academy of Sciences, the Rumford Medal, by the Royal Society of London, and the Rumford Medal by the American Academy of Arts and Sciences, as well as the Janssen Medal from the Institute of France, and the Medal of the Astronomical Society of France.

Many of Mr. Langley's public works had great literary charm, more especially the New Astronomy, which was based originally upon a series of Lowell lectures, that afterwards appeared in serial form in the *Century Magazine*. In general, few of his writings were couched in technical language, for, however, abstruse the subject, they were written so that they could be appreciated. He was firmly convinced that scientific writing could be made accessible to the public if sufficient pains were taken by the author, and in many of his papers, as well as in the work alluded to, he successfully attained this end.

He had a deep interest in all that related to things of the mind, and was for many years associated with both the American and British Associations for Psychical Research. He was an omnivorous reader of everything that was best in English and French literature, and was especially interested in George Borrow. He was the owner of a considerable collection of Borrow's manuscripts, and was a student of French history and memoirs. His interest in the fine arts was keen, and he had many times visited the galleries of Europe, and knew the great pictures everywhere. The Orient had a fascination for him, and he had a collection of the editions of the "Arabian Nights." As a young man, he was a great admirer of Thomas Carlyle, with whom he had an acquaintance, and to whose home he made several pilgrimages. He had a great love for little children, and the "Children's Room" in the Smithsonian building, mentioned above, was the result of his personal attention.

A last word in memory of Professor Langley may be added from personal acquaintance of the writer. Not least amongst the charms with which the great investigator was endowed was his intense modesty of character. Another charm was, perhaps, his sympathy with the work of others, even if that work was not in those directions in which his own mind had its bent.

The Experiments of the Brothers Wright.

As is notified in another part of this Journal, no less an authority than Sir Hiram Maxim has promised to address the members of the Aëronautical Society of Great Britain, on the subject of the recent experiments of the Brothers Wright, at the meeting of the Society on April 27th next. Many remarks on these experiments will therefore be now deferred. It may, however, be here stated that various reports which have come to hand seem to confirm the statements made by the Brothers Wright in the letter which was read to the members of the Aëronautical Society of Great Britain, at the opening meeting of the present session.

Our contemporary, *L'Aerophile*, in its January issue, has published many interesting statements obtained from various sources, concerning these remarkable experiments which may be the commencement of a new era in aërial navigation. The following details derived from *L'Aerophile*, and various other sources, may be of interest to our readers, though in the absence of the precise information which is still withheld by the experimenters, no responsibility for the accuracy of these details can be taken. Conflicting statements as to some of these details must also be regarded as a sign that full confirmation must be awaited before assigning them to the history of aërial navigation. As far as can be gathered from accounts received, the frame of the machine which in form is evidently very similar to the older double-decked gliding machines of Messrs. Wright, and familiar to our readers, is made of larch wood. From tip to tip of the wings, its length is 40 feet, its breadth in the widest part is only six feet. The frame is covered with canvas. The gasoline motor, is stated in some accounts, to be 15-horse power, in others, 21-horse power. The total weight of the machine is 925 lbs., that of the motor alone, 40 lbs. The operator lies face downwards, in a horizontal position on the lower plane, and as close to the frame as possible. Since a weight hanging below the centre of gravity, like a pendulum, causes the aëroplane to capsize, all weight has to be concentrated as near as possible in a common plane. As to the steering apparatus, there is some discrepancy in the accounts. Some describe

the rudder, which controls the vertical movements, as being in the middle of the machine, and the one which controls the horizontal movements as being at the rear.

It appears that the machine goes out of its shed on an inclined platform, mounted on an ingeniously constructed carriage, it glides on a rail to the end of the platform, when the motor is started, and the machine takes immediate flight.

The Forthcoming Flying Model Competition.

As will be seen in another part of this Journal, the Flying Model Competition, for the prize of ten pounds, offered by Major Baden-Powell, will take place at Sunningdale, Ascot, at the summer meeting of the Aëronautical Society of Great Britain, if the requisite number enter. It will be noticed that the time for the entries has been extended from April 30th, to May 31st, and it is hoped that members of the Aëronautical Society of Great Britain, their friends, and others interested in flight will make efforts to make this competition an instructive event, for the success of such a competition must depend upon the enterprise and ingenuity of individuals.

The rules for this competition, drawn up by the Council of the Aëronautical Society of Great Britain, will be found under the notices of the Society. It will be seen that a strong jury of those who are distinguished in the world of science has been elected to give the decision as to the winner of the prize.

It is, perhaps, possible that some may think that a model, weighing only one pound, is but a small affair, too small to give scope to the exercise of that ingenuity and skill that the motor-driven aëroplane demands. But it must be remembered that the aim of the President of the Aëronautical Society of Great Britain in offering this prize was to give opportunity to those who might not have large sums available to spend on elaborate and costly apparatus, knowing well that from small beginnings great consequences may ensue. And there is precedent in the past for such a belief. Take an example from the work of the immortal Faraday. It was in itself but a small experiment when he took up a magnet and plunged it into a little coil of wire connected with a galvanometer. It was but a small observation when he saw that the needle of the galvanometer was deflected, showing that the pressure of the magnet induced a current of electricity in the coil of wire. But in this simple experiment was the germ of the great electric industry in whose advantages we now partake. Had it not been for this historic observation, would the dynamo electric machine, whose energy lights our homes and streets, or the electric motor which whirls us about in subterranean railways have ever been evolved? So it is not impossible that in one of the Liliputian motor-driven aëroplanes invited to the competition at Sunningdale may be the germ of some discovery which may revolutionise our modes of locomotion by revealing the path to the conquest of the air.

The Monument in Memory of the Aëronauts of the Siege of Paris.

By a Member of the Paris Aëro Club.

France will never cease to be proud of the aëronauts of the siege of Paris. The memory of their deeds has been lately vividly revived in the unveiling of the monument in their honour at Neuilly, on the 28th of January last, by M. Etienne, the French Minister of War.

The monument has been raised by public subscription, and is the last work of the late M. Auguste Bartholdi, who died on October 5th, 1904. On the pedestal of the monument is a group of figures, above which is a balloon, carrying a flag in its car. The principal figure in the group is a woman, the symbol of the beleagured city. She is represented with a child in her arms, and looks with eyes of hope on a pigeon which she has released. A man, sword in hand, shields the woman. Another figure is represented hanging on to the net of the balloon, which is ready to ascend. A warrior leans against the car of the balloon.

The carrier pigeons which played so prominent a part in the balloon postal service, are memorialized on each of the four side groups. On each of these are two pigeons flapping their wings.

Previous to the ceremony of unveiling the statue, the surviving aëronauts of the siege

TO THE AERONAUTS OF THE SIEGE OF PARIS: THE MONUMENT BY BARTHOLDI WHICH HAS BEEN INAUGURATED AT THE PORT DES TERNES, NEAR PARIS.

By kind permission of the "DAILY GRAPHIC."

met at déjeuner. The company then proceeded to the Porte des Ternes, where were gathered the Minister of War, M. Dugardin-Beaumetz, Under-Secretary for Fine Arts; Comte Henri de La Vaux; Count Meaux-Saint-Mare, representing the President of the Republic; M. Janssen, the famous astronomer, who, in 1870, left the besieged capital in his balloon to observe an eclipse; M. Wilfred De Fonvielle; M. Albert Tissandier; Admiral Bienaimé; M. Antonin Dubois, Vice-President of the Senate; delegates from the Municipality of Neuilly, the Aëro Club de France, the Société des Aëronautes du Siege de Paris; the Société Française de Navigation Aérienne; the Académié Aëronautique; the Aëro Club du Sud-Ouest; and the Fédération Colombophile.

Before the commencement of the actual ceremony of unveiling the memorial, 5,000 carrier pigeons were released from the foot of the monument, which was then unveiled by M. Etienne. After this function, Comte Henri de La Vaux, on behalf of the Aëro Club of France, formally handed over the monument to the Municipality of Neuilly. In his speech he dwelt upon the patriotic interest of the event, and reminded his hearers that the resistance against the enemy was prolonged by the efforts of the aëronauts in establishing communication between Paris and the Provinces.

The Investigation of the Upper Air.

It is with no little satisfaction that this Journal is able to announce that the Meteorological Committee have assigned from the Parliamentary grant under their control, a sum for promoting the investigation of the upper air, by kites and other means. The immediate objects in view are:

1.—To establish an experimental station where the kite ascents and other experimental investigations can be carried out, especially on the days selected for international co-operation.

2.—To develop and extend the instrumental equipment, so that facilities may be afforded for the co-operation of other observers upon sea or land.

3.—To provide for the publication of the observations in combination with those of other countries by a contribution to the cost of the international publication undertaken by the President of the International Commission for Scientific Aërostation, Professor H. Hergesell, of Strassburg.

Mr. W. H. Dines, F.R.S., who is well known for the work he has done in connection with a joint committee of the Royal Meteorological Society, and the British Association, has undertaken the direction of the operations for the Meteorological Office. His experiments for the office are carried on at his house at Oxshott.

An endeavour is also to be made to enlist the co-operation of marine observers in correspondence with the Meteorological Office. Captain A. Simpson, of the Steamship *Moravian*, an observer of very long experience, has already expressed his willingness to make a trial of this method of extending our knowledge of marine meteorology, as soon as the necessary gear and instruments can be supplied.

Efforts have also been made to obtain the assistance of others interested in these investigations, with promise of success. Amongst those who have promised to help are: Lt.-Colonel J. E. Capper, of the Aldershot Balloon Companies, Mr. G. C. Simpson, lecturer in meteorology in the University of Manchester, Mr. C. J. P. Cave, and Mr. S. H. R. Salmon.

Military Aëronautics.

Military aëronautics in this country is now over-stepping those boundaries which have confined its practical use to the captive observation balloon. Experiments with the new airship that Colonel Templer has constructed will be eagerly awaited. The material of which it is made—gold-beater's skin—should be largely in favour of its practicality, and it may be noted that this is the first time that an airship has been made of the material that has been proved to be the best known substance for forming the envelope of a balloon.

The experiments at Aldershot with the Cody man-lifting kites have been conclusively successful. In future warfare, the use of the kite in windy weather, and the balloon in calm weather, should leave very few days

in the year unfit for taking observations of the enemy at altitudes.

Foreign armies are also becoming convinced of the necessity for extending the service of the air. It was last autumn that the French military authorities at Toul put the Lebaudy airship through a series of elaborate experiments, to test thoroughly its efficiency as a means of scouting and photographic survey. In its former capacity, a moving airship should excel the horizontally immovable captive balloon. For it can travel over a distant camp and fortress of the enemy, and discern its secrets. A Colonel in the French army, who ascended in the Lebaudy airship from Toul, was able to detect every detail of the fortress of St. Michael.

Amongst the experiments at Toul were also tests of the value of an airship for dropping explosives on the enemy, nor were its capabilities of rising to a considerable height to avoid the enemy's fire forgotten. In one test, as to altitude, the Lebaudy airship reached an altitude of 1,350 metres, and remained there one hour.

When the new aërial scout becomes a feature of warfare, efforts will undoubtedly be made to invent special guns for its destruction, but though ordinary artillery fire will be able to do damage when an airship is ascending or descending near the ground, the weapon that can successfully cope with it at considerable altitudes will not be easy to design.

Obituary.

THE LATE MR. STANLEY SPENCER.

We regret to record the death of Mr. Stanley Spencer, the well-known aëronaut, at Malta, from typhoid fever. Though his career as an aëronaut has been closed when still young, he lived long enough to win the reputation of being a dexterous and undaunted aëronaut. To him, indeed, hesitation and fear seemed unknown. His neatness of execution was strikingly exemplified in his numerous parachute descents, for carrying out which, he possessed an extraordinary aptitude. The parachute has been too frequently the cause of disaster and death in unskilful and untrained hands, but when manipulated by Mr. Stanley Spencer it seemed to be divested of its dangerous qualities.

Mr. Stanley Spencer made numerous ascents in ordinary balloons, but he will, perhaps, be most remembered for his airship voyages. His inspirited attempt to round the dome of St. Paul's Cathedral, will still be fresh in the minds of many Londoners. Success in that attempt was not achieved, but all who witnessed his efforts to perform a picturesque feat must have felt satisfied that had the proverbial British breeze blown with a little less force, his machine would have been as equal to the task as was that of M. Santos Dumont, when he rounded the Eiffel Tower.

Notes.

The Dirigeable Airship Competition at the Milan Exhibition.—In the published regulations governing the competition of dirigeable airships, at the Milan Exhibition, it is stated that the trial for this competition will consist in a trip without stoppages or refurnishments over the prescribed course. The prize will be awarded to the airship that will have gone over the course in the shortest time, provided it is under 45 minutes. The course is from Milan (Piazzi d'Armi) to Sesto S. Giovanni (Rondò), and back again. By the time taken, is meant the time employed by the airship to make the two trips going and returning, at full speed; thus, the time in starting the machine, in turning the machine at Sesto S. Giovanni, and the time necessary to stop machine past the return point, in Milan, will be deducted. The competitor will have to effect at least three competitive trials on three different days; he can make more if he wishes, up to a maximum of ten. From these trials the competitor himself must choose one for the classification.

M. Santos Dumont's Heliocoptère.—Though M. Santos Dumont has achieved no little success with his navigable balloons, he is evidently not an unbeliever in the heavier than air principle, for he is constructing an heliocoptère. In this arrangement, there are two horizontal screws for lifting a light bamboo frame-work, under which the aëronaut and his motor will be slung. There is a vertical guiding or pulling screw fixed to one leg of the frame-work, and a rudder to the other leg. The frame is 41 feet long. The motor, 24-horse power, weighs only 77 lbs., and the complete machine only 353 lbs.

Mr. Wellman's Proposed Expedition to the Pole in an Airship.—The *Westminster Gazette* recently published some details concerning the airship in which Mr. Wellman hopes to journey to the North Pole.

He has selected the Godard Airship, as being the best adapted to the bold project. Its length is about 160 feet. There are two sets of motors and propellers, which can be worked separately or together. One of these propellers is 50-horse power, and this actuates a screw working at the prow of the keel. The smaller one is 25-horse power, working a screw at the stern. When both are used conjointly, the speed is estimated at 25 miles an hour. The envelope of the balloon will be made of an outside layer of silk, varying in stoutness from the centre, where it will be subjected to the greatest strain, to the ends, and several alternate layers of cotton and of rubber.

Mr. Wellman proposes to spend three weeks this summer in making experimental flights from his base at Spitzbergen. Then, if the atmospheric conditions are favourable, he will make the start. If unfavourable, he will wait until the summer of 1907. The expedition is to be furnished with an equipage of sledges, some motor-driven, and boats, so that in case of failure by the airship the explorers may have a good chance of safety.

The Russian War Balloons.—According to a lecture lately delivered by Dr. Frederick Waechter, and reported in the *New York Herald*, it appears that the balloons used by the Russians in the Russo-Japanese war proved anything but a success. The reason of failure is considered to be the immobility of the Russian balloon equipment. Originally, the Russians possessed only a fortress ballooning detachment, which developed the gas from sulphuric acid and iron. It consisted of 76 waggons, and made such slow progress on the bad roads, that it was never in the place where it was wanted.

The East Siberian ballooning detachment, established during the course of the war, produced the necessary gas by means of caustic soda and aluminium. This resulted in a considerable saving in weight, so that only 26 waggons were required to enable the balloons to make an ascent. The train, however, is still too heavy for practical purposes.

The Use of Kites in Wireless Telegraphy.—The uses of kites are becoming more and more apparent. The *Graphic* lately gave its readers an interesting note as to their application to wireless telegraphy. It appears that the longest distance which a wireless telegraph message has been transmitted over land was from the warship *West Virginia*, of the American Fleet, to Fort Leavenworth, Kansas, far in the interior of the States. The message traversed mountains, rivers, and several other natural obstructions, and was received by the operator at Fort Leavenworth by means of kites. The highest kite of the series has a tiny wireless mast, which intercepts the ether waves conveying the message. The wire connecting the kites with the ground terminates in the receiving apparatus shown on the ground. The distance traversed by the message was 1,300 miles.

The Mathematical Investigation of Aeroplanes and Aerocurves.—The pioneer work of Professor G. H. Bryan and Mr. Peter Williams, in treating mathematically the problem of the longitudinal stability of aërial gliders is well known to the readers of this Journal. It appears, that in France not only has the work of these two authors received profound attention, but that it has stimulated others to take up the important research. It was recently noted by *Nature* that Captain Faber of the French Artillery, in conjunction with M. Maillet, had worked out an investigation of the subject which is published in *Revue D'artillerie*. This research deals with both longitudinal and lateral stability, and includes many important conclusions relating to stability and the injectories of aëroplanes, the motion of which is stable.

The Barring of the Eiffel Tower to Aeronauts.—It appears that no longer will the Eiffel Tower be a turning post for aëronauts. An official circular, in fact, issued by the President of the Tower, formally warns off aëronauts from its precincts. In this circular, attention is drawn to the fact that the Eiffel Tower is connected from its summit with a wireless telegraphy station, and spider thread-like wires project from the Tower, which menace damage to an approaching airship.

The Milan Exhibition.—Mr. Eric Stuart Bruce, the Honorary Secretary of the Aëronautical Society of Great Britain, has been elected a member of the International Committee for the management of the various aëronautical competitions to take place during the exhibition.

Foreign Aëronautical Publications.

(In this list a selection of some of the more notable articles is only given.)

L'AÉRONAUTE (Paris).

January, 1906.—Etude de la vision ou distance des horizons pour diverses hauteurs (Paul Bordé).—Préparation de l'hydrogène pur pour ballons (M. de Fonvielle).

February. — Inauguration du Monument de Neuilly.—Procédé pour la détermination de la vitesse de descente d'un aérostat employé par les aéronautes Japonais.—Le Déviateur Sauveteur.

March.— Pour L'Aviation et L'Aérostation Dirigeable (J. Leloup).—Petits Planeurs Naturels et Boomerang (Jansen).—Aérostation Japonaise.

L'AÉROPHILE (Paris).

February, 1906.—Portraits d'Aéronautes Contemporains : Colonel D. Pedro vivès Y Vich (Georges Besançon).—L'Eclipse du 30 Août, 1905, à Burgos (Gustave Hermite).—Observations en ballon pendant l'éclipse du 30 Août, 1905 (H. de La Vaux et J. Jaubert).—L'Aéroplane sur roues de M. Vuia (A. de Masfrand).

ILLUSTRIERTE AËRONAUTISCHE MITTEILUNGEN (Strassburg).

January, 1906.—Die vermeintliche Gefährlichtkeit des Ballonfahrens und die damit verknüpfte versicherungsfrage (C. Busley). — Funkentelegraphie in der deutschen Armée.

February.—Die Meteorol gischen Schwierigkeiten der Drachenaufstiege (Kurt Wegener).—Uber Feldballonabteilungen.—Die Versuche der Gebrüder Wright im Jahre, 1905.—Plauderei aus der Geschäfftsstelle des Niederrhun'schen Vereins fü- Lugtschiffährt.

March.—Die Tage Mit für Motorballons günstigem Wetter (Kurt Wegener).—Ubungen des Preussischen Luftschiffer Bataillons bei Thorn.—Mitteilungen über Luftschiffährt unter Vorführung eines Flugapparates (R. Schelies).

WIENER LUFTSCHIFFER-ZEITUNG (Vienna).

January, 1906.—Die Luftschiffährt, 1905.—Die November-Hochfahrt (Dr. Anton Schlein).—Verifizierung der Höhenformel.—Rudolf Hubel.

February.—Im Dienste der Wissenschaft.—Die Wright Frage.

March.—Im Ballon Uber Die Pyrenäen.—J. Janssen.—Eine Südpol Expedition.—Der Lebaudy als Militärballon.—Graf Zeppelins Luftschiff (Eugen Wolf).

Applications for Patents.

(Made in January, February and March.)

The following list of Applications for Patents connected with Aëronautics has been specially compiled for the AËRONAUTCAL JOURNAL by Messrs. BROMHEAD & Co, Patent Agents, 33, Cannon Street, London, E.C.

JANUARY.

1187. January 16th. GEORGES THIEL, CHARLES HENRY HERBERT CROSSE. **An Improved Navigable Balloon or Airship.**

1436. January 19th. HARRY MARTIN MIDDLETON. **Improvements in and relating to Airships.**

1747. January 23rd. PAUL DE MONTGOLFIER. **Propelling and Supporting Arrangement and its Applications for Navigation of the Air and Water.**

2425. January 31st. JAMES DENNIS ROOTS. **An Improved Aërial Machine.**

FEBRUARY.

2868. February 6th. GIOVANNI PERTOT. **Improvements in and relating to Ships, dirigeable Balloons, Torpedoes or like vessels.**

3775. February 15th. CARL FRIEDERICH HERMANN HOHLER, JOHANN FRIEDERICH LAEDERACH. **A Flying Machine.**

3899. February 16th. JAMES WHARTON, GEORGE LEE. **An Improved Aërial Machine.**

4204. February 20th. WILLIAM HENRY FAUBER. **New or Improved Apparatus for Aërial Navigation.**

MARCH.

6033. March 13th. CHARLES EBENEZER RICHARDSON. **Improvements in Kites.**

6368. March 16th. SIDNEY JOHN LAWRENCE, FRANCIS ALLAN GLENN. **Improvements in Propellers for Aërial and Marine Propulsion.**

6443. March 17th. BADEN FLETCHER SMYTH, BADEN-POWELL. **Improvements in Aërial Machines.**

6502. March 17th. WASSILY REBIKOFF. **Improvements in or relating to the Propulsion of Vessels or Bodies in the Air or Water.**